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ABSTRACT

Computer-assisted career guidance systems (CACGS) are one of the tools used by career counselors to facilitate the career decision making process of deliberating counselees. These systems are characterized by some inherent contradictions and face problems which must be solved or circumvented in order to increase their usefulness. Considering the apparent advantages CACGs one may ask why they are not used even more widely. A possible answer to this question is that many systems face difficulties which may impair their potential benefits. These difficulties can be attributed to some inherent contradictions which characterize CACGs. Relevant issues include problems concerning the occupational database; the complexity of the career decision making process; the effectiveness of the dialogue; and the context in which the CACGs is embedded. Acknowledging the existence of these contradictions and understanding the inherent problems in them is a necessary step in overcoming, circumventing, or at least minimizing them. In fact, many of the problems characterizing CACGs are also inherent in traditional face-to-face career counseling. Career counselors, as well as future practitioners who are presently students, must become aware of these problems in order to better utilize the potential of CACGs. (ABL)

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Computer-Assisted Career Counseling:
Inherent Contradictions, Problems, and Prospects

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Abstract

Computer-assisted career guidance systems (CACGS) are one of the tools used by career counselors to facilitate the career decision making process of deliberating counselees. These systems are characterized by some inherent contradictions and face problems which must be solved or circumvented in order to increase their usefulness. The relevant issues are (a) problems concerning the occupational database, (b) the complexity of the career decision making process, (c) the effectiveness of the dialogue, and (d) the context in which the CACGS is embedded. After describing and analyzing each problem, we explore possible ways to overcome, circumvent, or at least minimize it. Finally, the implications for face-to-face career counseling where many of these problems are also encountered are discussed.

Computer-assisted Career Counseling:
Inherent Contradictions and Prospects

In the last two decades career counseling has been accompanied by novel computer-based interventions. Computer-assisted career guidance systems (CACGSs) may be described as an implementation of accumulated knowledge about career guidance which permits better career decisions making. Indeed, CACGSs, which serve thousands of users daily (Sampson & Reardon, 1990), have received more and more attention in recent years (e.g., Rayman, 1990; Sampson, et al. 1990). However, most of this attention has been descriptive (e.g., Rayman, 1990; Taylor, 1988), some evaluative (e.g., Sampson et al. 1990), and only little of it theoretical (e.g., Katz & Shatkin, 1983) or critical (e.g., Johnston, Buescher, & Heppner, 1988). While these systems flourished during the ten years that have passed since Katz and Shatkin's (1983) comprehensive discussion of the characteristics of CACGSs, comprehensive conceptual analyses of CACGSs have been less frequent than these systems deserve. In light of the advancements in career counseling and career decision, it is again time to analyze, evaluate, and constructively criticize CACGSs from both the theoretical and the practical viewpoint.

Considering the apparent advantages of CACGSs (Harris-Bowlsbey, 1984; Katz & Shatkin, 1983; Sampson et al., 1990), one may ask why they are not used even more widely. A possible answer to this question is that many systems face difficulties which may impair their potential benefits. These difficulties, we assume, can be attributed to some inherent contradictions which characterize CACGSs. Acknowledging the existence of these contradictions and understanding

the inherent problems in them is a necessary step in overcoming, circumventing, or at least minimizing them.

In fact, many of the problems characterizing CACGSs are also inherent in traditional face-to-face career counseling. Career counselors, as well as future practitioners who are presently students, must become aware of these problems in order to better utilize the potential of CACGSs. Thus, whether the role of CACGSs is perceived as a tool, an alternative, or a change agent (Watts, 1986), career counselors cannot afford to disregard these systems, which are becoming more and more a part of the repertoire of counseling procedures.

The present discussion adopts an information processing and decision-theoretical viewpoint of career decision making (Brown, 1990; Gati, 1986; Gati & Tikotzki, 1989; Gelatt, 1962; Jepsen & Dilley, 1974; Kaldor & Zytowski, 1969; Katz, 1966; Mitchell & Krumboltz, 1984, 1991; Peterson, Sampson, Reardon, 1991; Pitz & Harren, 1980; Slaney, 1988; Thoresen & Mehrens, 1967). We begin by reviewing the difficulties concerning the occupational database and the career decision making process which utilizes this database and propose options to circumvent or minimize them. Next we discuss characteristics of an effective computerized dialogue. After an exploration of the general context in which CACGSs are embedded, the implications for career counselors are discussed. It is important to emphasize that because the aim is not to grade CACGSs but rather to contribute to their improvement, no reference will be made to any particular system.

The Occupational Database

The occupational database is the heart of both career information

and career guidance systems. This database contains the information about the occupational (or educational) alternatives, including the distribution of each characteristic or aspect for each of the occupations. It provides the basis for a structured search for occupational alternatives compatible with the user's characteristics and thus allows the user to identify relevant occupational information. Three problems related to the occupational database are described and discussed in the following sections.

The Apparent Accurate Image of the Data Included in CACGSs versus the Unique "Soft" Character of the Information in them

Computer-based information systems have an image of being infallible and accurate systems (Sampson, 1986). One source for this image is that computers are perceived as machines which, except for rare cases of malfunctioning, always produce accurate results. The other source of perceived accuracy is the fact that the information stored in computers usually includes well-defined data like names, addresses, telephone numbers, and prices, which are, except for errors, always valid. Thus, in almost all encounters between the typical career decision maker and computer data, the data is perceived as perfectly accurate.

However, CACGSs in general include not only objective data (e.g., length of training, tuition fee) but also "soft" information whose selection and presentation involve experts' judgments, as no objective indices are available for them (e.g., "independence", "personal responsibility"). The "soft" information included in CACGS systems can be divided into two types. The first, structured information, refers to the kind of data that can be translated into and adequately represented by categories. For example, the degree of variety

involved in a particular occupation may be represented by one of five levels (e.g., very high, above average, average, below average, very low). Because this categorization is based on expert judgments (and depends on the specific group of experts used) it has less than perfect reliability and validity.

The second type of soft information available in CACGSs is that of unstructured -- free text -- data. This kind of information includes narrative descriptions about occupations which may be interpreted idiosyncratically. Expert judgment also plays a crucial role in the selection, shaping, and presentation of the unstructured information included in the system. Therefore, the presented information is potentially subject to unintentional biases. There is thus a contrast between the objective data and accurate computer hardware, on the one hand, and the human judgment involved in the presentation of information by experts as well as its processing by the deliberating individuals, on the other.

As there is no way to circumvent human judgment, it is important for both system developers and career counselors to acknowledge the unique "soft" characteristics of a major proportion of the information included in CACGSs. Furthermore, it seems important to explicitly inform the users that human judgment is involved not only in the narrative descriptions but also in the structured categorical information, as well as in the selection, processing, and display of all information. To facilitate this message, the soft information itself should be presented in a way that intentionally demonstrates this subjectivity (e.g., using verbal qualitative labels like "high" or "low" instead of quantitative ones). This will help deliberaters realize that the information is not necessarily "true" in an absolute

sense.

The Difference between the Apparent Objectivity of the Data and its Subjective Meaning to the Individual Career Decision Maker

The processing and assimilation of any information is unique because it is affected by the individual's personality, information processing style, and life experiences (Mitchell & Krumboltz, 1990; Pitz & Harren, 1980). These individual differences may result in attributing different meanings to the same, apparently objective information. To provide the information about yearly income, an example of apparently objective data, occupational information specialists compile the average yearly income of people in each occupation. Because these data refer to gross income, they disregard three relevant factors. First, income depends on position and seniority in the occupation. Second, net income depends on the family size and whether, for example, one has a spouse who works and contributes to the family income. Third, different amounts of money are required in order to maintain the same standard of living in different locations. Combining these factors with the individual's subjective value of money implies that even the apparently objective data of "yearly income" does not directly provide the relevant information for the career decision maker, namely, the standard of living that income provides.

One possible way to reduce the illusion of objectivity is to use subjective labels which do not imply numerical or quantitative accuracy, as mentioned in the previous section. Specifically, a system may include qualitative (but still ordered) categories and labels like "high", "average", and "low" (e.g., as with respect to prestige) using expert judgments based on the distribution of the

aspect under consideration across occupations. While this may introduce some ambiguity as to what is meant by "high", it provides the relevant information with respect to the differences among occupations in the aspects under consideration.

The Central Tendency in the Data versus the Within-Occupational Variance

Because of the information-processing and storage-capacity limitations of both CACGSs and their users, the information characterizing an occupation with respect to a particular aspect (e.g., the distribution of "income" for lawyers) has to be summarized in order to make it useful. In most CACGS systems this summary is done by using measures of central tendency (e.g., the average yearly income, the median rating of prestige). However, the mean, like any central tendency measure, does not reflect the actual within-occupational variance (e.g., Matarazzo, 1986). The observed within-occupational variance may depend, for example, on the degree of seniority as well as within-occupation specialization (e.g., Meir & Yaari, 1988). For example, physicians' personal responsibility depends on their speciality and seniority. Because this within-occupational variance is not only an integral part of the occupation's characterization, but also reflects the fact that different kinds of people may engage successfully in the same occupation (Super, 1953), it should be brought to the career decision maker's attention explicitly.

How to present the within-occupational variance in the aspects characterizing an occupation in a way that will still be informative is a non-trivial challenge assuming that presenting the whole distribution is both undesirable and unfeasible. One possible

solution to this problem is to characterize an occupation with respect to each aspect by using a number of variations or levels rather than a single most representative variation (Gati, 1986, 1992); specifically, to present for each aspect those variations which characterize a sufficiently significant number of people engaged in that occupation. This procedure of using a range of variations allows, for example, characterizing psychologists both as "providing mental help" (e.g., clinical psychologists) and as "not providing mental help" (e.g., organizational psychologists).

The Career Decision Making Process

In spite of the differences between career guidance systems that can be attributed to the systems' theoretical rationale and the specific stages corresponding to it, certain characteristics of the career decision making process are represented in most guidance systems. First, there is a module used to elicit the user's career-related preferences. These preferences are then used to carry out a systematic search for suitable occupational alternatives on which the user can focus in the quest for occupational information. In the following sections we identify and characterize five problems related to these processes of eliciting preferences and providing the users with a set of suitable occupations.

Stimulating Users to Elicit Their Aspirations and Preferences but Encouraging Them to be Ready to Make Compromises

In order to utilize preferences and identify suitable occupations, career decision makers have to explicate their set of desirable characteristics, that is, systematically describe the "ideal" occupation for them (Gati & Winer, 1987; Zakay & Barak, 1984). The ideal occupation is defined by the most desirable variation in

each of the aspects regarded as relevant by the career decision maker. Thus, a desirable characteristic of CACGSs is to facilitate the explication of the characteristics of the ideal occupation.

However, since the ideal occupation usually does not exist in the real world, most career decisions involve compromises (Gati, 1992; Gottfredson, 1981; Hesketh, Elmslie & Kaldor, 1990; Leung & Harmon, 1990; Taylor & Pryor, 1985). Compromise refers to the need to consider not only the most desirable variation in the relevant aspects, but also additional variations which are still considered acceptable (Gati, Shenhav, & Givon, 1992). The need to compromise and accept the involved loss in having a variation which is different from the ideal one, makes the decision process more difficult (Gati, 1992). The involved difficulty, however, should not prevent compromise. Rather, considering compromises should be inherent in the dialogue with CACGSs.

Because, career decisions involve both the elicitation of ideal or optimal preferences, and the need to compromise and consider additional variations as acceptable, both stages should be reresented in CACGSs, and perceived less as a contradiction and more as complementary. The way a CACGS deals with these two facets of preferences is significant both for the individual's perception of the process of making career decisions and for its outcome (i.e., the set of occupational alternatives which are identified as compatible with the individual's preferences).

Increasing or Decreasing the number of Occupational Alternatives Considered by the Career Decision Maker

The number of potential occupational alternatives which can be chosen by the individual is large. During the deliberating period, it

is generally desirable to identify a small set of alternatives to focus on in the collection of occupational information. Thus, the individual is expected first to elaborate in order to create and explore a variety of potential solutions, including occupational alternatives not considered previously, and later to crystallize and reduce the list of career options (Peterson, Sampson, & Reardon, 1991). Comparing and contrasting occupations, which is feasible only in a small set, is expected to result in a more appropriate choice, and in an increased sense that the decision was made responsibly (Sampson, 1992). However, individuals who approach a CACGS (or a career counselor) do not necessarily have such a small set in mind. Rather, they come with a unique set of alternatives, which may be larger or smaller than the desired set. Even if the career decision maker has some idea about his or her preferences, the number of compatible alternatives may still be very large (e.g., there are 44 occupations which correspond to the RIE code; Holland, 1985, Appendix A). The question is, thus, whether a CACGS should attempt to increase or decrease the number of alternatives in the set considered by the individual approaching the system.

In order to deal with these individual differences, an ideal system should tailor itself to the unique needs of the career decision maker. The need to expand or to reduce the set of considered alternatives depends, among other factors, on the degree that his or her preferences are already crystallized. Specifically, for those who have only one or a few alternatives in mind, an increase may be beneficial, as it may introduce alternatives worth considering which the individual may not have been aware of. For those who have no idea or only a vague idea regarding their future occupation, the system

should aim at decreasing the number of potential alternatives in order to permit a more realistic, in-depth exploration. Nevertheless, regardless of the size of the set of occupations considered by the deliberating individual, identifying a limited sized set of suitable alternatives from which the individual can choose after additional consideration seems to be a desirable target of CACGSs.

The Dual Face of Dominance

One of the most powerful and useful concepts of decision analysis is dominance. Dominance refers to the case where an alternative a is as good as another alternative b with respect to some of the relevant aspects, and is better than b with respect to some other aspects (Huber, Payne, & Puto, 1982). Identifying dominated alternatives (which are as such clearly less suitable than others) is very helpful because it reduces the number of alternatives to be considered in the following stages of the decision making process. Hence, most CACGSs attempt to identify dominated alternatives and eliminate them from the individual's list of suitable alternatives.

To identify a limited set of alternatives compatible with the individual's preferences, many systems employ a sequential or conjunctive search, when the aspects selected by the user serve as the criteria. This creates a problem in that the dominance of the alternatives in this small set over those eliminated is based only on those aspects which were considered in the search, but not in other, more important or less important, aspects. This means that in fact we cannot be sure that there is a dominance relationship between the alternatives in the small set and the alternatives which have been eliminated. Thus, although locating dominated alternatives is desirable, the observed dominance may not be valid for all aspects.

Because it is impractical to include all potentially relevant aspects in CACGS, there is no perfect solution to this problem. Nevertheless, there are four ways to minimize it. First, it is important to increase the career decision maker's awareness that the dominance of the small set is based only on those aspects which were taken into account in the search process. Second, the search should follow the importance order of aspects specified by the user. While this cannot assure dominance in all aspects, it can at least assure dominance in the relatively more important aspects of the occupations which were retained over those eliminated. Third, compromise should be encouraged because the probability of dominance increases with the number of aspects considered in the search process. A larger readiness to compromise will result in the elimination of fewer alternatives at each step, thus requiring more aspects to be considered if their number is to be reduced. Finally, the fourth possible step to minimize the problem is to persuade users who arrived at their list of compatible occupations on the basis of a relatively small number of aspects to use an additional search procedure for suitable occupations (e.g., based on a compensatory computation, Gati, 1986; Janis & Mann, 1977; Katz, 1966).

Providing or Not Providing a Ranking of Alternatives

Identifing one alternative which seems the best one, or arriving at a rank order of a few alternatives according to their proximity to the individual's ideal occupation, is a desirable outcome of the career decision making process, and is the outcome many users expect from a CACGS. The question is what the dialogue with the CACGS should do. Should it help the user identify such a single best alternative or a rank order of a few best alternatives? Or should it permit only

the identification of a small set of relatively better options, without ranking them (and hence also without identifying the best one). In the context of the dialogue with a CACGS there are advantages to both possibilities. On the one hand, ranking brings the deliberater one step closer to the target of choosing a single best alternative. On the other hand, lack of ranking allows the individual to freely explore and finally choose the best alternative. Avoiding ranking encourages the in-depth exploration of the different alternatives in the small set and provides the individual with a sense of control and freedom of choice. Moreover, a prescribed ranking may be accepted by an individual without further examination, particularly if such a ranking is provided by an "infallible" computer-based system. Can this contradiction between the user's quest for ranking and the problems associated with providing it be solved?

If providing ranking is preferred, then the next question is whether the ranking arrived at during the dialogue with a CACGS is valid? In a CACGS, any potential ranking can be based only on the set of aspects which were included in the system's database. Probably this ranking would be different if additional aspects, not included in the system, were also taken into consideration. A possible partial solution may be incorporating into CACGSs a module in which the user can enter the names of additional aspects not included in the system, and then characterize the small set of alternatives that were identified as preferable by these additional aspects (e.g., Wooler, 1985; Zakay & Barak, 1984). As these characterizations supplement the original database, the ranking may be based on all aspects, including the individual's unique ones. Unfortunately, this solution faces the problem of reliability and validity of the characterizations

attributed by the individual to the various alternatives. Because all alternatives in the small set are already better than those which were excluded from it in the considered aspects, the specific ranking crucially depends on the unique characterizations of the individual. Because these characterizations may be invalid, a ranking which is very sensitive to even slight differences may not be the optimal one if based on them. Therefore, in spite of many CACGSs users' expectations, it seems undesirable that the dialogue with any CACGS will result in an explicit rank order of alternatives (or identifying only a single best one); rather, identifying a small set of unranked alternatives should be the outcome. This reason for not presenting a ranking may be added to the consideration that receiving such a ranking from a CACGS may bind the users.

Dealing with Uncertainty

Another problem related to the career decision making process is the way to deal with the uncertainty inherent in most such decisions (Gati, 1990; Gelatt, 1989). Uncertainty is associated with several elements of the decision making process, including: (a) the chances of being accepted to and successfully finishing the selected training route, (b) the individual's success and satisfaction in the chosen occupation, and (c) the individual's future occupational preferences.

In general individuals prefer to avoid uncertainty (Tversky & Kahneman, 1981). Furthermore, there may be an expectation that these uncertainties and the resulting ambiguity should be eliminated in a computerized system, which is perceived as well-defined and exact. Thus, there is a contradiction between the uncertainty inherent in making career decisions and the individual's desire to avoid it. The question is whether we should attempt to eliminate from CACGSs these

uncertainties and the resulting ambiguity, because they are so disliked, even though they are so inherent in career decisions?

It is proposed that CACGSs should not attempt to eliminate uncertainty, but rather aim at reducing it. Providing information regarding the required conditions for acceptance into the relevant training institutions, as well as the chances of successfully graduating after being accepted, reduces the corresponding uncertainty. Providing information regarding the required skills and capabilities in the occupation and the relevant job characteristics reduces the uncertainty regarding the individual´s ability to succeed in and be satisfied with the occupation. Finally, with respect to uncertainty concerning future preferences, the elicitation of a range of acceptable levels for the aspects used in the search for suitable occupations, instead of only the ideal or optimal level, seems to provide a satisfactory solution. While none of these solutions is perfect, their combination may improve, even if only partially, the usefulness of CACGSs.

Conducting an Effective Dialogue

Because the interaction between a career counselor and a deliberating counselee is unique in its complexity and involves a variety of ways of communicating, it cannot be replaced by a dialogue between a computer and a deliberating individual. Nevertheless, today´s hardware and software permit quite a flexible dialogue, where the degree of flexibility depends on the way the system developers decided to structure and design the CACGS. The challenge is enormous: How to imitate parts of the dialogue between the counselor and the counselee without pretending or imposing the illusion that the computer is in fact a counselor. In the following sections we discuss

some features of an effective computer-based dialogue.

Providing as much Information as Possible, but without Drowning the User in it

Providing detailed information about the alternatives the user wishes to explore in depth is a major target of many CACGSs because it permits better decisions. This information may include descriptions of typical jobs, desirable personal characteristics required in occupations, rare specialties, etc. While theoretically there is a very large amount of such information, the limitations of human information processing (Peterson, Sampson, Reardon, 1991; Pitz & Harren, 1980) dictate that only part of it may be included in any CACGS.

Too much information, the product of combining more important with less important or even irrelevant information, results in only partial processing of the information, so that part of it, perhaps even the more relevant part, is disregarded. Yet, in contrast to face-to-face dialogues between counselors and counselees, system designers have no control over which parts of the presented information have been processed and retained by the user. Therefore, system developers have to make prior judgments about the relevance of each piece of information to the deliberating individual's decision in order to provide all the relevant, but only the relevant, information. Hence, the problems of what-information to select, which criteria guide the selection, and who decides what to select are of great significance (Katz & Shatkin, 1983).

Sophistication of CACGSs but only "Behind" the Monitor

Because of the complexity of the career decision-making process, an ideal CACGS system must be a very complex one. Notions like

decision support system, expert system, uncertainty, dominance, and sensitivity analysis, which should be represented in CACGSs to improve the career decision making process, may be understood by those who have received formal or informal training in decision counseling but not by others. Although these notions are an integral part of a desirable decision-making process, they may only intimidate and confuse the novice. The question is how, or whether at all, to present these notions to the deliberating individual.

One solution is that these sophistications should be hidden in the computer and behind the monitor, by translating the concepts and the related procedures into simple, straightforward, and understandable terms which may be incorporated into CACGSs. Thus, options titled "what if" or "why not" (e.g., Katz & Shatkin, 1983) seem to represent certain characteristics of a decision support system, and "almost suitable occupations" those of sensitivity analysis.

Flexible versus Constrained Dialogue

System designers intend in general to give the career decision makers the feeling that the users are in control of the system, and that all the options in the system are open for them. In many cases, however, there is a particular sequence of options which seems to be best suited for a particular career decision maker. For example, for most career decision makers it seems more desirable to begin the dialogue by searching for a small set of occupational alternatives compatible with their preferences, before asking for information on any particular occupation. Thus, combining flexibility in the modules used and their sequence with some constraints on the dialogue is a classical challenge to CACGSs developers.

One solution to the flexibility versus structuring debate is to induce the career decision maker to go through the modules in the order which is assumed to be the preferred one, but without forcing her or him to do so. This can be done either implicitly, by displaying the list of modules in a specific preferred order, or explicitly, by recommending a particular order of modules. An additional solution is to combine the various approaches in some way: for example, to begin with a certain fixed sequence of modules which the user cannot change, but then to continue the dialogue by presenting additional modules which the user can choose from (with or without implicit or explicit recommendations).

The Interface

An effective dialogue depends not only on the content of the information but also on the way it is delivered. An attractive human-computer interface is a desirable feature of CACGSs. Making the dialogue a kind of computer game, for example, may increase its apparent attractiveness, although a gamelike CACGS system may impose an image of unseriousness, which may impair its potential positive impact. At the same time, attempts should be made to develop a CACGS that will not be perceived as an indisputable authority, because such perceptions may reduce the users' readiness to engage in constructive exploration of alternatives not recommended by the system, and reduce their awareness of the fact that the information in the system is subjective. How to deal with the potential incompatibility between the need for seriousness and attractiveness is a question faced by all CACGSs.

One way of making the delivery more effective is by using colors, thus producing a more vivid dialogue. However, this characteristic

should not be wasted by haphazard use of the potential embedded in computer and multimedia technology. Thus, for example, the target should not be to cram into the dialogue as many colors as are available in the system's displays (e.g., Sampson et al., 1990). Rather, colors can be selected to highlight relevant information, and to facilitate the processing of the presented information (e.g., green for "OK -- continue", red for "stop and reconsider").

Another facet concerns the way the information should be delivered. Reading information from a computer monitor rarely results in complete retention of all relevant information. The apparent solution to this problem is to provide the CACGS users with a printed copy of the complete dialogue, so that they can take this home or to their career counselors. This solution, however, again faces the problem of information overload, because the entire dialogue can spread over tens of pages. Omitting some screens and retaining others to shorten the printout is not a sufficient solution; rather, the selected information has to be processed and reorganized. Thus, CACGSs should attempt to provide the user with a shortened and well-organized summary (e.g., of about 6-8 pages).

The Organizational Context of CACGSs

CACGSs may be conceived as one of the tools available at career counseling centers, where access to them is monitored and controlled by the career counselor, who may recommend or discourage its use. However, CACGSs may also be conceived as independent, "stand-alone", systems, and hence as an alternative to available services (e.g., Watts, 1986). Such "stand-alone" CACGSs need not be restricted to career centers but can be allowed to be freely distrubuted. A few CACGSs even include a short questionnaire at the beginning of the

dialogue to elicit information from the individual in order to advise him or her about which modules to use. This questionnaire may be regarded as a substitute for an "intake" interview by a career counselor. Still, there are many features of the human-human interaction which can not be replaced by CACGSs.

The question at hand is perhaps not whether we should attempt to develop a CACGS which will replace the career counselor, but rather what should characterize a CACGS which could be distributed unrestrictedly, independently of any counseling center? Such a system should take into account all the previously mentioned contradictions and problems, and provide sophisticated circumventions and solutions for them. A complete list of the all desirable characteristics of such a "stand-alone" system exceeds the scope of the present discussion. Nevertheless, one such feature, which has not yet been explicitly discussed, is described in detail in the following section.

Quality control for the dialogue and its outcome. An experienced human counselor can monitor the quality of the interaction with the counselee and judge whether the counseling process and its outcome are satisfactory. A dialogue with a CACGS system, however, does not allow this kind of real-time human monitoring. Can we incorporate a quality control component into CACGSs?

The first question is what criteria constitute good quality in CACGSs. The dialogue may be considered successful and of good quality when the user utilizes the system in an effective way, reflecting a constructive career decision making process, and the outcomes indicate that the dialogue benefitted the user (Gati, 1986; Katz, 1979; Krumboltz, et al., 1982). Specifically, we can examine the number and sequence of modules used by the career decision maker, the sequence

and amount of the requested occupational information, and the degree of compatibility between the set of occupations the user requested information about and the set of alternatives identified by the CACGS as suitable for him or her (e.g., Gati & Tikotzki, 1989). In the case of a dialogue evaluated as having low quality based on these criteria, the dialogue can end with a corresponding note (which should appear also in the summary printout, e.g., "It is recommended that you approach a career counselor in order to discuss your dialogue and its outcomes"). However, the assessment of the criteria which are assumed to reflect the quality of the process and the outcome requires a theory guiding the evaluation of the respective parts of the dialogue.

The second question is how to incorporate the desirable characteristics of quality control, which are also inherent in human counselors' work, into the frame of guidance provided by CACGSs. Two possibilities may be proposed. The first is to incorporate into CACGSs a component which monitors the users's dialogue in real time, based on criteria such as those mentioned above, which are assumed to reflect the quality of the dialogue and its outcomes. The other possible solution to quality control is to carry it out <u>after</u> the dialogue ends. Assuming that the dialogue with a CACGS ends with a summary printout of the dialogue, then we may use career counselors' judgments to assess the quality of the dialogue by having the counselor go through this printed dialogue and evaluate to what degree the dialogue was indeed useful to the career decision maker.

Conclusions and Implications

<u>Relevance for Face-to-Face Career Counseling</u>

Many of the problems encountered by CACGSs that were reviewed above are also relevant to face-to-face career counseling, and some

suggestions discussed above for minimizing them seem to be applicable as well. These problems and proposals to overcome them are reviewed in the following sections.

The occupational database. The problem of how to transform data into useful information is not restricted to CACGSs but also arises during counseling. Career counselors provide their counselees with information which may be subject to unintentional selection and presentation biases, as in CACGSs. Furthermore, counselees may not question the information given them by career counselors, who may not always be perfectly updated. With respect to the use of CACGS as part of the counseling process, it is important that both the career counselors and career counselees who use these systems be aware of the subjectivity of a significant part of the database in most CACGSs. Furthermore, deliberating individuals may attribute more than the deserved credibility not only to information in computers but also to printed materials (e.g., the DOT, OOH, career information booklets). Finally, highlighting within-occupational variance as well as the subjective meaning of the objective data (e.g., of a yearly income of $ 40,000) is of relevance during counseling.

Affecting the career decision making process. Eliciting aspirations but then stressing the importance of compromises, and increasing versus decreasing the number of considered alternatives, are an integral part of many counselor-counselee dialogues. Also integral are the search for dominated alternatives which can be eliminated to reduce complexity, and the need to deal with uncertainty. However, the reasons against ranking are less relevant. During the counseling sessions the individual's unique considerations can be identified and explicated, and relevant information may be

collected and discussed with the counselor. These aspects may then be compared with the corresponding characteristics of the occupations and taken into account under the counselor's supervision. We assume that during these counseling sessions the individual plays an active role in the ranking process. Hence, in contrast to CACGSs, there is no obstacle to arriving at a ranking of alternatives during face-to-face career counseling.

Effective dialogue. The tension between providing all the relevant information and the information processing capabilities of the counselee, as well as the question of how to present in understandable terms the complexities involved in making decisions, constitute an ongoing challenge for career counselors. Even the issue of the flexibility of the process is of relevance, because, unlike the general claim for individualized, unique interventions during face-to-face counseling, informal observations suggest that often counselees receive, initially at least, the same set of assessment instruments and undergo a similar sequence of interventions (Sampson, 1992). Cooperation and exchange of ideas between system developers and career counselors seems to have potential benefit for making both types of dialogues more fruitful (e.g., by improving taxonomies of career decision making problems, Campbell & Cellini, 1981).

The context. Career counseling is generally provided by a single career counselor who sits in a room with a career counselee. Like a CACGS, such a "stand-alone" career counselor cannot provide adequate counseling without a guiding theory and without valid assessment instruments and relevant occupational information. Thus, the issue of quality control is also relevant for face-to-face counseling. One possible source for guidelines for what constitutes quality control of

a human "stand-alone" system is the standards and the licencing requirements of professional organizations (e.g., of the APA, AACD). We may ask which of these requirements are also applicable in defining the desirable characteristics of a "stand-alone" CACGS. At the same time, some of the proposed criteria for quality control of CACGS may also be considered in evaluating career counseling.

The Agenda for the Future

Assuming that there are indeed various problems and contradictions inherent in the design and operation of CACGSs, we now discuss some implications. For some problems, we believe, there are acceptable solutions today (although not all of them are utilized at present in certain CACGSs, or in an optimal manner). For others we do not yet have adequate solutions. These include, in our opinion, (a) the unique "soft" character of the information in CACGS, (b) the difference between the apparent objectivity of the data and its subjective meaning to the deliberating individual, (c) providing much information without drowning the user in it, (d) whether to provide a ranking of alternatives, and if so, how, and (e) how to design systems with on-line quality controls good enough so that CACGSs need not be restricted to career counseling centers. It seems that there are possibilities to minimize or circumvent these problems in ways which have not yet been fully developed and tested, and hence these problems should be given high priority in future research.

Career Counselors' Involvement in CACGSs

Career counselors may benefit from deepening their familiarity with CACGSs and increasing their awareness of the advantages and disadvantages of these systems. This familiarity may result in two outcomes. First, career counselors can contribute to the effective

use of CACGSs by better utilizing the available systems. This can be reflected in: (a) constructively criticizing available systems, identifying their weaknesses, suggesting improvements and solutions to their problems, and, if possible, also participating in the development teams; (b) active participation in the selection of the system(s) out of the many available ones; (c) designing diagnostic prescreening procedures regarding who should be guided to the available CACGSs, when, and to which ones (Peterson, Sampson, Reardon, 1991); and (d) integrating the dialogue with the CACGS in the counseling process by active monitoring (Sampson, Peterson, Reardon, 1989, e.g., by reviewing the dialogue's printout and discussing it with their counselees). The second outcome of career counselors' familiarity with CACGSs may be the adoption of certain features of CACGS into the career counseling process. For example, decision theory (e.g., Brown, 1990; Gati, 1986; Gelatt, 1962; Jepsen & Dilley, 1974; Kaldor & Zitowsky, 1969; Mitchell & Krumboltz, 1984) or an information processing approach (e.g., Peterson, Sampson, Reardon, 1991; Pitz & Harren, 1980) may be considered as an alternative theoretical framework to guide the career counseling process.

To conclude, we explored several problems of CACGSs and claimed that many of these problems also characterize face-to-face career counseling. Yet, while during face-to-face counseling these are handled implicitly and ad-hoc solutions are sought, CACGSs highlight the problems because during the dialogue with them circumvention is not so simple and the solutions required need to be explicit. Thus, the study of these problems may contribute not only to the improvement of CACGSs but to career counseling theory and practice as well. Indeed, a comparison of face-of-face career counseling with CACGSs,

identifying their common characteristics and unique features, deserves an in-depth discussion. This, however, exceeds the scope of the present article, and is left for future discussions. Meanwhile, we may agree with Watts (1986) that CACGSs can indeed be conceived as having multiple roles: as a tool, as an alternative, and as an agent for change.

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